Time -

Let the no of boxes be B and in total n elements

Firstly we have to insert the elements into the boxes so now as all the elements might have mapped to same box so in worst case for a insertion you have to surpass n-1 before thus o(n^2) this step

Now we are taking each such box where one have at worst n elements so the worst case to sort them will be n logn

Otherwise the things can be divided among the boxes and one cannot have more than one n strings so if each of them m1,m2,..Mn thus to sorth them it will be m1logm1,.... So we will have some B.nlogn value

We push all the lists into a array thus we will have o(n) time and a B(which is a constant) multiple of it in worst case

After that we have N elements and quick sort N log N here N is the total number of elements in the final array obtained

Thus it would be O(n^2) + O(B.nlogn)(This B and n depened on how many boxes are there having elements and how many elements are there in a particular box) + o(n) + o(n log n)for final sorting or i mean max of these 3

Space -

o(n^2) space as we are maintaining array of lists